



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

Address: COMMISSIONER FOR PATENTS

P.O. Box 1450

Alexandria, Virginia 22313-1450

www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/593,519	02/08/2007	Claus Hviid Christensen	66228(53730)	1406
21874 7590 03/25/2011 EDWARDS ANGELL PALMER & DODGE LLP P.O. BOX 55874 BOSTON, MA 02205				
EXAMINER				
CHAN, HENG M				
ART UNIT		PAPER NUMBER		
1728				
MAIL DATE		DELIVERY MODE		
03/25/2011		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/593,519

Applicant(s)

CHRISTENSEN ET AL.

Examiner

HENG M. CHAN

Art Unit

1728

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 January 2011.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 21-47 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 21-47 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-912)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Status of Application

Applicant's amendments and remarks filed 1/13/2011 have been acknowledged.
Claims 21-47 are pending.

Claim Objections

1. The previous objections of claims 21 and 31-43 have been withdrawn as a result of Applicants' amendments.

Claims 44 and 47 are objected to because all the steps of claim 44 and components of the electric power generating unit are shared by the two claims. The scope of claim 44 is enclosed by that of claim 47.

Claim Rejections - 35 USC § 112

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
2. The previous rejections of claims 39, 45, and 46 under 35 USC 112, 2nd paragraph have been withdrawn as a result of Applicants' amendments.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
3. All previous grounds of rejections as generally presented in the previous Office action are proper and stand. They have been reiterated below for convenience.

4. Claims 21-25, 28, 31, 32, 35-39, and 43-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 2002/0028171 to Goetsch et al., in view of US 2001/0042378 to Pfister et al.

Regarding claim 21, Goetsch et al. teach a fuel cell system, i.e. an electric power generating unit, having constituents comprising:

(i) an ammonia storage device in the form of a container (vessel);
and (iv) a reactor for dissociating ammonia into hydrogen and nitrogen and a hydrogen fuel cell for converting hydrogen into electric power (abstract; [0017]).

Goetsch et al. do not expressly teach that the ammonia storage device (i) comprises an ammonia absorbing and releasing salt of the general formula: $M_a(NH_3)_nX_z$, wherein: M is one or more cations selected from the group consisting of alkali metal, alkaline earth metal, and transition metal ions, or combinations thereof, X is one or more anions selected from the group consisting of fluoride, chloride, bromide, iodide, nitrate, thiocyanate, sulphate, molybdate, and phosphate ions, a is the number of cations per salt molecule, z is the number of anions per salt molecule, and n is the coordination number of 2 to 12. Goetsch et al. also do not expressly teach (ii) means for heating said container and ammonia absorbing and releasing salt for releasing ammonia gas.

Pfister et al. also relate to the generation and utilization of ammonia gas and teach that ammonia is stored in an ammoniated metal salt having the formula $MA_nX(NH_3)$, wherein M corresponds to M of the claimed formula and is at least one metal selected from the group consisting of alkali metals, alkaline earth metals, scandium,

ytterbium, the lanthanides, titanium, zirconium, hafnium, vanadium, niobium, tantalum, chromium, molybdenum, tungsten, manganese, technetium, rhenium, iron, ruthenium, osmium, cobalt, rhodium, iridium, nickel, palladium, platinum, copper, silver, gold, zinc, cadmium, mercury, tin, and aluminum; A corresponds to X of the claimed formula and is at least one ion selected from the group consisting of Cl, Br, F, I, ClO_3 , ClO_4 , BF_4 , AlCl_4 , PF_6 , SbCl_6 , and SbF_6 ; n corresponds to z of the claimed formula and is from 1 to 6; and X corresponds to the coordination number n of the claimed formula and is from 1 to 8 ([0015-16]; Tables 1 and 2). The number of cations a of the claimed formula is 1 in the formula of Pfister et al. Pfister et al. also teach that ammonia alternately adsorbs and desorbs from the metal salt and the desorption step being accomplished by conventional heating methods that raise the temperature of the ammonia absorbing and releasing complex or by applying microwave energy where application of heat is undesirable ([0004]; [0011]).

It would have been obvious to one of ordinary skill in the art at time of invention to have used the ammonia absorbing and releasing salt such as those disclosed in Pfister et al. in the electric power generation unit of Goetsch et al., motivated by the fact that the skilled artisan would have looked into the prior arts for sources of ammonia and ways to store it in the ammonia storage device of Goetsch et al. and would have appreciated the metal salts of Pfister et al. that store ammonia in the solid form as opposed to the noxious gaseous form and alternately absorb and release ammonia ([0011]), which means that ammonia can be generated by heating based on demands of the ammonia dissociation reactor and hydrogen fuel cell. As a result, the skilled

artisan would have also appreciated having the means for heating the container and ammonia absorbing and releasing salt as suggested by Pfister et al. in order to accomplish the release of ammonia for the electric power generation unit of Goetsch et al. based on demands of the ammonia dissociation reactor and hydrogen fuel cell.

Regarding claims 44 and 47, Goetsch et al. teach a method for producing electrical power, said method comprising:

- providing an electric power generating unit comprising:
 - an ammonia storage in the form of a container (vessel);
 - providing (ii) a reactor for dissociating ammonia into hydrogen and nitrogen and a fuel cell for converting hydrogen into electric power; and
 - producing electrical power (abstract; [0017]).

Goetsch et al. do not expressly teach that the ammonia storage device comprises an ammonia absorbing and releasing salt of the general formula: $M_a(NH_3)_nX_z$, wherein: M is one or more cations selected from the group consisting of alkali metal, alkaline earth metal, and transition metal ions, or combinations thereof, X is one or more anions selected from the group consisting of fluoride, chloride, bromide, iodide, nitrate, thiocyanate, sulphate, molybdate, and phosphate ions, a is the number of cations per salt molecule, z is the number of anions per salt molecule, and n is the coordination number of 2 to 12. Goetsch et al. also do not expressly teach providing and using means for heating said container and ammonia absorbing and releasing salt for releasing ammonia gas.

Pfister et al. also relate to the generation and utilization of ammonia gas and teach that ammonia is stored in an ammoniated metal salt having the formula $MA_nX(NH_3)$, wherein M corresponds to M of the claimed formula and is at least one metal selected from the group consisting of alkali metals, alkaline earth metals, scandium, yttrium, the lanthanides, titanium, zirconium, hafnium, vanadium, niobium, tantalum, chromium, molybdenum, tungsten, manganese, technetium, rhenium, iron, ruthenium, osmium, cobalt, rhodium, iridium, nickel, palladium, platinum, copper, silver, gold, zinc, cadmium, mercury, tin, and aluminum; A corresponds to X of the claimed formula and is at least one ion selected from the group consisting of Cl, Br, F, I, ClO_3 , ClO_4 , BF_4 , $AlCl_4$, PF_6 , $SbCl_6$, and SbF_6 ; n corresponds to z of the claimed formula and is from 1 to 6; and X corresponds to the coordination number n of the claimed formula and is from 1 to 8 ([0015-16]; Tables 1 and 2). The number of cations a of the claimed formula is 1 in the formula of Pfister et al. Pfister et al. also teach that ammonia alternately adsorbs and desorbs from the metal salt and the desorption step being accomplished by conventional heating methods or by applying microwave energy where application of heat is undesirable ([0004]; [0011]).

It would have been obvious to one of ordinary skill in the art at time of invention to have provided an ammonia storage comprising the claimed ammonia absorbing and releasing salt and means for heating the container and ammonia absorbing and releasing salt for releasing ammonia gas in the method of Goetsch et al., motivated by the fact that the skilled artisan would have looked into the prior arts for sources of ammonia and ways to store it in the ammonia storage device of Goetsch et al. and

would have appreciated the metal salts of Pfister et al. that store ammonia in the solid form as opposed to the noxious gaseous form and alternately absorb and release ammonia ([0011]), which means that ammonia can be generated by heating based on demands of the ammonia dissociation reactor and hydrogen fuel cell. As a result, the skilled artisan would have also appreciated using the means for heating the container and ammonia absorbing and releasing salt as suggested by Pfister et al. in order to accomplish the release of ammonia for the electric power generation unit of Goetsch et al. based on demands of the ammonia dissociation reactor and hydrogen fuel cell.

Regarding claims 22 and 45, Pfister et al. teach that M comprises a member selected from the group consisting of Li, Na, K, Cs (alkali metals), Mg, Ca (alkaline earth metals), V, Cr, Mn, Fe, Co, Ni, Cu, Zn, NaAl, KAl, K₂Zn, CsCu ([0015]; [0021]).

Regarding claims 23 and 46, the limitation reciting "to saturate the ammonia absorbing and releasing salt with ammonia" is considered to be a function of the means for adding ammonia. Goetsch et al. do not expressly teach means for adding ammonia.

Pfister et al. teach that ammonia is added back to a sorber **12**, where the ammoniated metal salt is contained, via an evaporator **42**, a pressure sensor **50**, a check valve **46**, and line **36** (Fig. 1; [0027-29]; [0041-44]). The evaporator **42**, pressure sensor **50**, check valve **46**, and/or line **36** constitute a means for adding ammonia that is capable of saturating the ammonia absorbing and releasing salt with ammonia.

It would have been obvious to one of ordinary skill in the art at time of invention to have provided the claimed means for adding ammonia in the electric power generating unit of Goetsch et al. because Pfister et al. teach that ammonia is released

and adsorbed via reversible heat-induced reactions such as those in Table 2 and so the skilled artisan would have used a means for adding ammonia to saturate the ammonia absorbing and releasing salt with ammonia by pushing the reversible heat-induced reactions toward the left side of the reactions to regenerate the fully ammoniated salts.

Regarding claim 24, Pfister et al. teach that the ammonia absorbing and releasing salt comprises $\text{Mg}(\text{NH}_3)_6\text{Cl}_2$ (Table 1).

Regarding claim 25, Pfister et al. teach that the ammoniated salts form a sorbate/sorbent complex and the dry salts comprise a powder ([0018]; [0041]). The metal salts, for example, MgCl_2 , are crystals and the resulting ammoniated salts are expected to be crystals as well.

Pfister et al. do not expressly teach that the salt comprises a powder of microcrystals.

However, it would have been obvious to one of ordinary skill in the art at time of invention to have made the ammoniated salt of Pfister et al. as a powder of microcrystals because the skilled artisan would have appreciated that micrometer sizes of the ammoniated salts would help increase the surface area of the ammoniated salt, which is used as a sorbent.

Regarding claim 28, Goetsch et al. teach that heat is generated by chemical reactions to provide heat for the reactor for dissociating ammonia ([0038]).

Goetsch et al. do not expressly teach a means for heating the ammonia storage device comprising heat produced by chemical reactions.

Pfister et al. teach a means for heating the ammonia absorbing and releasing salt comprising conventional heating methods that raise the temperature of the salt and microwave energy ([0004]; [0011]).

It would have been obvious to one of ordinary skill in the art at time of invention to have used the heat produced by chemical reactions to heat the ammonia storage device of Goetsch et al. because the skilled artisan would have appreciated using all available heat sources to efficiently run the electric power generating unit of Goetsch et al.

Regarding claim 31, Goetsch et al. teach that reactor for dissociating ammonia comprises a heterogeneous catalyst ([0026]).

Regarding claim 32, Goetsch et al. teach that the heterogeneous catalyst comprises a support and an active phase ([0029]).

Regarding claim 36, the limitation "wherein a fraction of the hydrogen produced in the reactor, unreacted hydrogen from one of the fuel cells, or a mixture thereof is oxidized for providing heat for heating said reactor for dissociating ammonia" is a process limitation that describes the intended use or function of the combustion device and does not impart structural limitations to the claimed apparatus. Where the prior art apparatus is capable of the intended use or function, the claim is met. In this case, Goetsch et al. teach that a portion of the hydrogen thus produced is combusted in said reaction zone by an exothermic reaction, thus producing enough heat in-situ to run the ammonia decomposition reaction ([0015]). That is, the electric power generating unit of

Goetsch et al. comprises the claimed combustion device capable of providing heat for the reactor for dissociating ammonia.

Regarding claim 38, the limitation "wherein a fraction of the ammonia released from the ammonia storage, unreacted ammonia from one of the fuel cells, or a mixture thereof is oxidized for providing heat for heating said reactor for dissociating ammonia" is a process limitation that describes the intended use or function of the combustion device and does not impart structural limitations to the claimed apparatus. Where the prior art apparatus is capable of the intended use or function, the claim is met. In this case, Goetsch et al. teach that ammonia oxidation also takes place during hydrogen combustion, which also contributes heat for the ammonia decomposition reaction ([0037]). That is, the electric power generating unit of Goetsch et al. comprises the claimed combustion device capable of providing heat for the reactor for dissociating ammonia.

Regarding claims 35, and 37, the limitations "wherein a part of the hydrogen produced in the reactor, unreacted hydrogen from one of the fuel cells, or a mixture thereof is oxidized for providing heat for heating the ammonia storage device" in claim 35 and "wherein a fraction of the ammonia released from the ammonia storage, unreacted ammonia from one of the fuel cells, or a mixture thereof is oxidized for providing heat for heating said ammonia storage device" in claim 37 are process limitations that describe the intended use or function of the combustion device and do not impart structural limitations to the claimed apparatus. Where the prior art apparatus is capable of the intended use, the claim is met. In this case, Goetsch et al. teach that a

portion of the hydrogen thus produced is combusted in said reaction zone by an exothermic reaction, thus producing enough heat in-situ to run the ammonia decomposition reaction ([0015]) and that ammonia oxidation also takes place during hydrogen combustion ([0037]). That is, the electric power generating unit of Goetsch et al. comprises a combustion device capable of oxidizing a part of hydrogen and ammonia to provide heat for the reactor for dissociating ammonia and the ammonia storage device.

Regarding claim 39, Goetsch et al. do not expressly teach that the constituents of the electric power generating unit are dimensioned to provide full balancing of the complete unit by dimensioning tubes, chambers, flows, insulation, temperature, etc. to obtain optimal output of electrical energy from the electric power generating unit.

However, it would have been obvious to one of ordinary skill in the art at time of invention to have arrived at the claimed invention because the skilled artisan would have provided the constituents in scale for the operation conditions and best performance of the electric power generating unit of Goetsch et al. The skilled artisan would have understood that the apparatus might fall apart otherwise due to, for example, pressure buildup within a tube dimensioned too small for flow.

Regarding claim 43, the instant claim contains a recitation with respect to the manner (i.e. the temperature conditions) in which a claimed apparatus is intended to be employed. However, since the manner of operation does not necessarily impart structural limitations on the claimed invention and Goetsch et al. teach all the structural limitations of the claim, i.e. an inner reaction chamber **10** and an outer reaction chamber

12 of the reactor for dissociating ammonia ([0038]; Fig. 2), the manner of operation does not differentiate the claimed apparatus from a prior art apparatus. See MPEP § 2114. Furthermore, the inner reaction chamber **10** is operated to dissociate most ammonia and produce a product stream comprising hydrogen, nitrogen, and small amounts of breakthrough ammonia and the outer reaction chamber **12** is operated to combust a last present fraction of ammonia and generate enough heat to drive both the reactions in the inner and outer chambers ([0038]). It is believed that the two chambers of Goetsch et al. are capable of the claimed operations at low and high temperatures, respectively.

5. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Goetsch et al. and Pfister et al. as applied to claim 21 above, in view of US 2002/0166335 to Smith et al.

Regarding claim 26, Pfister et al. teach that the salt makes a sorbate/sorbent complex that adsorbs and releases ammonia gas ([0018]).

Pfister et al. do not expressly teach that the salt comprises a porous support material.

Smith et al. also relate to sorbate/sorbent system and teach that the sorbent includes a porous support material with a high pore volume and thus a high surface area to accommodate the absorption of large amounts of sorbate ([0026]).

It would have been obvious to one of ordinary skill in the art at time of invention to have arrived at the claimed invention because the skilled artisan would have

appreciated the structural support and large surface area provided by the porous support material for the salt to undergo the adsorption/desorption cycle repeatedly.

6. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Goetsch et al. and Pfister et al. as applied to claim 21 above, in view of US 3,423,574 to Tabor et al.

Regarding claim 27, Pfister et al. teach means of heating including conventional heating methods that raise the temperature of the ammonia absorbing and releasing salt and microwave energy ([0004]; [0011]).

Pfister et al. do not expressly teach that the means of heating comprises an electrical resistive heating device.

Tabor et al. also relate to heating devices and disclose an electrical resistance heating pad (abstract).

It would have been obvious to one of ordinary skill in the art at time of invention to have used an electrical resistive heating device such as that provided by Tabor et al. as the means of heating because the skilled artisan would have obtained expected results by substituting one conventionally used heating device with another.

7. Claims 29, 30, and 40-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goetsch et al. and Pfister et al. as applied to claim 21 above, in view of "Microfuel processor for use in a miniature power supply" published in Journal of Power Sources 108 (2002) 21-27 by Holladay et al.

Regarding claims 29, 30, 41, and 42, Goetsch et al. do not expressly teach the reactor for dissociating ammonia or the container and means for heating as part(s) of a micro-size electric system, respectively.

Holladay et al. also relate to an electric power supply and teach a microscale fuel reformer and a miniature fuel cell for supplying power to microelectronic devices (abstract; introduction, 1st paragraph).

It would have been obvious to one of ordinary skill in the art at time of invention to have made dissociating ammonia or the container and means for heating part(s) of a micro-size electric system, motivated by the fact that the skilled artisan would have made the reactor for dissociating ammonia a microscaled constituent just as the microfuel processor, and made other constituents including the container and means for heating also micro-sized parts, in order to produce a miniature power supply that operates at efficiencies appropriate for microelectronics as suggested by Holladay et al.

The limitation reciting "that can be fabricated using..." in claim 29 is optional as indicated by the word "can." As a result, the limitation in claim 30 is also optional. Similarly, the limitations reciting "being that can be micro fabricated..." in claims 41 and 42 are also optional as indicated by the word "can." Additionally, these limitations are product-by-process limitations that do not impart structural limitations to the electric power generating unit because they are directed to the fabrication of a micro-size electric system, not the claimed electric power generating unit.

Regarding claim 40, the instant claim recites that the power generating unit of claim 21 comprises a unit in the form of a micro-size power source, which means that

the micro-size unit is a part of the power generating unit of claim 21. However, the specification supports that the power generating unit itself is in the form of a micro-size power source ([0082]). For examination purposes, the instant claim is considered as described in the specification.

Goetsch et al. do not expressly teach that the electric power generating unit is a unit in the form of a micro-size power source for microelectronic devices or micro-electro- mechanical-systems (MEMS).

Holladay et al. also relate to an electric power supply and teach a microscale fuel reformer and a miniature fuel cell for supplying power to microelectronic devices (abstract; introduction, 1st paragraph).

It would have been obvious to one of ordinary skill in the art at time of invention to have arrived at the claimed invention because the electric power generating unit would be in the form of a micro-size power source for microelectronic devices as suggested by Holladay et al. once its constituents are fabricated on the microscale.

8. Claims 33 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goetsch et al. and Pfister et al. as applied to claim 21 above, in view of US 2003/0104936 to Mao et al.

Regarding claims 33 and 34, Goetsch et al. teach that the active phase comprises dispersed transition metals, for example, Fe, Ni, Co, and Ru ([0028]; [0029]; [0031]).

Goetsch et al. do not expressly teach that the transition metals are nanoparticles.

Mao et al. also relate to supported transition metal catalysts and teach that the transition metals are in the form of nanoparticles (abstract)

It would have been obvious to one of ordinary skill in the art at time of invention to have used nanoparticles of transition metals in the heterogeneous catalyst of the reactor for dissociating ammonia in the electric power generating unit of Goetsch et al., motivated by the fact that Mao et al. teach that nanoparticles of the catalyst enlarges available surface area and therefore results in higher catalytic activity ([0006-7]; [0028-29]).

Response to Arguments

9. Applicant's arguments filed 1/13/2011 have been fully considered but they are not persuasive. Applicants argued that metal amine salts almost exclusively have been used in applications where the ammonia is not consumed as in refrigerating systems where ammonia is the cooling agent, or in applications where ammonia pressure vessels would have been too heavy for applications such as automotive applications and so it is not seen how Goetsch and Pfister would have been combined. The Examiner had presented the rationale that because Goetsch needs a source of ammonia and Pfister provides a source of ammonia in the form of an ammonia absorbing and releasing salt, the skilled artisan would have solved the ammonia storage problem of Goetsch using the salt of Pfister. Once ammonia is released from the salt of Pfister, it can be used as taught by Goetsch to generate electric power.

10. Applicants argued that the metal ammine salts would not have been used because of the cost associated with ammonia storage in, delivery from, and process for saturating the metal amine salts, when possible large amounts of ammonia have to be stored and released. Even if these problems were true, the skilled artisan would have adjusted the amount of the metal amine salt depending on the amount of ammonia needed and weighed the pros and cons of using such salts as a means to store and provide ammonia, having recognized not only the problems, but also advantages such as storing ammonia in the solid form as opposed to the noxious gaseous form and alternately absorb and release ammonia (Pfister [0011]) and controlled release of ammonia based on demand.

11. Finally, Applicants pointed out the way Goetsch discloses decomposing ammonia in a reactor and concluded that one would not have considered the metal salts of Pfister to be used to supply the reactor of Goetsch. However, the way that Goetsch supplies the ammonia to the reactor is not relevant to how the ammonia is stored and released. This argument is thus moot.

Overall, the combination of Goetsch and Pfister would have resulted in an electric power generating unit comprising both (1) an ammonia storage device in the form of a container with ammonia containing metal salt and with means for heating to the metal salt to absorb and release the ammonia, and (2) and (a) an fuel ammonia cell or (b) a reactor for dissociating ammonia and a hydrogen fuel cell. If Applicants would like to further describe what is considered to be a "unit," specific structural details must be claimed.

Cited Not Applied Prior Art

If Applicants still question the use of the metal amine salts in an electric power generating unit, please consider US 2004/0253492 to Vajo ([0016]).

Conclusion

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HENG M. CHAN whose telephone number is (571)270-5859. The examiner can normally be reached on Monday to Friday, 9:30 am EST to 6:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer K. Michener can be reached on (571)272-1424. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jennifer K. Michener/
Supervisory Patent Examiner, Art Unit 1728

/HENG M CHAN/
Examiner, Art Unit 1728